VII.

Leçons d'Anatomie Comparée, de G. Cuvier, *Membre de l'Inſtitut National, Profeſſeur au Collége de France, et à l'Ecole Centrale du Pantheon, &c. recueillées et publiées ſous ſes yeux par* C. Dumeril, *Chef de Travaux Anatomiques de l'Ecole de Médecine de Paris: Tome I, contenant les Organes du Mouvement: Tome II., contenant les Organes des Senſations.* 8*vo. Paris. An* VIII.

THIS work is introduced by a letter from Cuvier himſelf to J. C. Mertrud, Profeſſor of Comparative Anatomy at the Muſeum of Natural Hiſtory of Paris, in which he notices the importance of comparative anatomy, and the difficulties with which its proſecution is attended; the advantages he derived from the Muſeum of Natural Hiſtory, and from the permiſſion to diſſect, not only the animals which died in the menage, but alſo thoſe which have been collected for many years from all parts of the world, and preſerved in ſpirits; the obligations he owes to the naturaliſts and anatomiſts who have preceded him; and the aſſiſtance he received from many of his pupils. With regard to diſcoveries of his own, with peculiar modeſty he declares, that he has no other merit than that of having profited of the advantageous circumſtances in which he was placed. This important work, which was originally collected from his lectures by his pupil Dumeril, he has carefully reviſed and corrected, and acknowledges as his own. He conſiders it as an abridgment of the very extenſive work which he himſelf is preparing, but which will ſtill require ſeveral years before it can be publiſhed.

The firſt part of the work itſelf has been ably tranſlated by Mr Allen, ſurgeon in Edinburgh, and publiſhed under the title of an Introduction to the Study of the Animal Economy. It begins with a general view of the functions exerciſed by animals.—The idea of life is one of thoſe vague and obſcure ideas ſuggeſted ed to us by the obſervation of phenomena that ſucceed in regular and correſponding trains. Having obſerved in our own bodies, and in many bodies ſimilar to our own in form and ſtructure, a power of reſiſting, for a certain period, the laws which regulate unorganized bodies, and even of acting upon other bodies in oppoſition to theſe laws, we employ the terms Life, vitality, vital power, to expreſs theſe apparent exceptions from the ordinary courſe of nature.

The general and common characteriſtics of all organized beings are, an origin by generation, an increaſe by nutrition, and a termination by death. The functions exerciſed by organized beings, are reduced under three orders. The firſt conſiſts of the functions which are eſſential to animal life, which qualify animals to fulfil the part aſſigned to them by nature in the general arrangement of the univerſe, and which would ſuffice for their exiſtence, if it were to be of only momentary duration. Senſation and voluntary motion form this firſt order of functions, and are termed the Animal functions. But animated machines poſſeſs an internal principle of ſupport and reparation, to which are ſubſervient all the functions which contribute to the nouriſhment of the body; that is, digeſtion, abſorption, circulation, reſpiration, perſpiration and excretion. In the laſt place, the life of animals having fixed limits that vary according to the ſpecies, generation is a function of the third order, deſtined to ſupply new individuals in the place of thoſe who are removed by death, and thus to perpetuate the exiſtence of every ſpecies of animals.

Our author next proceeds to give a general idea of the organs which compoſe the body of an animal, and afterwards to exhibit a view of the principal differences among animals in their ſyſtems of organs, which conſtitute the proper object of comparative anatomy. The organs ſubſervient to motion, preſent the following great and leading differences. The bones either form an internal articulated ſkeleton, covered by the muſcles; or the muſcles are placed internally, and ſurrounded by ſcales or ſhell; in theſe are no hard parts to ſerve as a lever or fulcrum for motion.

Animals of the firſt kind, have the body ſupported along its middle part by a column formed of diſtinct pieces of bone, piled over one another, and called the ſpine of the back or vertebral column. The animals with vertebræ conſiſt of four claſſes, the mammalia, birds, reptiles, and fiſhes.

Of the animals without vertebræ, the inſects have the body and limbs inveloped in ſcales articulated together; the teſtacea are incloſed within ſhells, and the ſoft worms are entirely deſtitute of hard parts.

The differences of the internal part of the nervous ſyſtem, preſent three well-marked diviſions; the firſt of which comprehends animals, in whom neither veſſels nor nerves have been diſcovered, forming the claſs of zoophytes or polypi. The ſecond conſiſts of animals in whom the brain is placed above the alimentary canal, while the remaining part of the common medullary cord is placed beneath it, and in the ſame cavity with the viſcera; forming the claſſes of molluſca, cruſtacea, inſects, and including part of the articulated worms. The third diviſion, conſiſting of animals in whom the medullary cord is placed above the alimentary tube towards the back, and incloſed within a canal, formed by the vertebral column, conſtitutes the claſs of animals with vertebræ.

The differences in the external ſenſes, relate either to their number, or to their goodneſs.

The organs of digeſtion preſent two remarkable differences. In the greater part of the zoophytes, the inteſtines form a bag which has but one opening, ſerving at once to admit the food, and to diſcharge the excrement. But all other animals have two diſtinct openings for theſe purpoſes placed at the two extremities of the alimentary canal. The chyle either paſſes through inviſible pores in the coats of the inteſtinal canal, and tranſudes through every part of the body, as in the zoophytes and inſects, or it is taken up by abſorbent veſſels, and carried into the general maſs of blood.

In the inſects and zoophytes there is no circulation. In the reptiles it is ſingle; and in the mammalia, birds, fiſhes, and many of the molluſca, it is double. When the circulation is ſingle, there is but one heart; but where the circulation is double, there is ſometimes one heart at the baſe of the pulmonary artery, and another heart at the baſe of the principal artery, and theſe two hearts either form a maſs, as in man, in the mammalia, and in birds, or they are ſeparated, and placed at ſome diſtance, as in the genus ſepia. In other caſes, there is but one heart for both circulations, which is either placed at the root of the principal artery of the body, as in ſnails and other molluſca, or at the root of the pulmonary artery, as in fiſhes.

The air either acts directly on the blood, and is introduced into the interior of the body, or it acts through the medium of water; in which caſe, the water paſſes merely over the ſurface of that organ, and the laminæ by which the ſurface is multiplied are called the gills or branchiæ. There are gills in fiſhes, and in many of the molluſca; but in place of laminæ, the organ of reſpiration ſometimes conſiſts of looſe fringes. Where the air acts directly on the blood, it penetrates into the interior of the body, either by one opening, as in all animals which have lungs, properly ſo called, or by more openings than one, which is the caſe only with inſects, and is called reſpiration by means of tracheæ. Laſtly, ly, none of the zoophytes except the echinus, aſterias, and other genera belonging to the ſame order, have any viſible organs of reſpiration.

The organs of voice offer but two general differences. In birds, the glottis is placed at the bottom of the trachea; in quadrupeds and reptiles, it is placed at the top of the trachea, and at the root of the tongue. Theſe are the only claſſes provided with a glottis.

Generation differs with regard to its mechaniſm, and with regard to its produce. In a few of the zoophytes it takes place without copulation. In other animals, the ſexual organs are either placed together in the ſame individual, as is found among the molluſca and zoophytes, or are placed in two ſeparate individuals, as in inſects and all animals with vertebræ. Some hermaphrodites, as the bivalve teſtacea, have no occaſion for the conjunction of two individuals, in order to produce offspring; whereas this is eſſentially neceſſary in ſnails and other ſpecies of molluſca, which creep upon the belly, among whom each individual performs at one and the ſame time the function of both male and female.

The offspring of generation is either a bud projecting from the parent, and growing from it like the branch of a tree, till completely developed; or it is a fetus which arrives at maturity in the uterus of its mother, where it is attached by veſſels, and from which it comes out alive; or it is an embryo ſhut up within a ſhell, along with a ſubſtance connected to it by veſſels, and which it converts into nouriſhment before it is completely hatched. From theſe varieties, animals are ſaid to be gemmiparous, viviparous, or oviparous. The gemmiparous claſs is confined to a few zoophytes and articulated worms. The viviparous claſs includes man and the other mamalia. All other animals are oviparous. Some animals have at birth the ſame form which they afterwards retain. Other animals are quite different in form at birth from what they are in their perfect ſtate. Theſe metamorphoſes occur only in inſects, and in reptiles without ſcales, that is, in frogs and ſalamanders.

In the animals with vertebræ, the organs of ſecretion are glands; in inſects they are tubes of different lengths; and in the zoophytes,

phytes, ſeparate organs of ſecretion have not been diſcovered.

Our author next proceeds to take a view of the relations which exiſt between variations in the different ſyſtems of organs. It may be conceived, that a vaſt number of combinations might be formed, correſponding to as many claſſes of animals, by uniting each ſeparate modification of each particular organ, with all the modifications of the other organs in ſucceſſion. But many of theſe combinations cannot exiſt, becauſe the organs of a living body are related by their reciprocal action upon one another, and by their concurrence in producing a common effect, ſo that the modifications of any one organ, affects the modifications of every other organ. Such of theſe modifications as cannot co-exiſt in the ſame individual, may be regarded as mutually excluſive; while there are other modifications that reciprocally imply, as it were, each other's exiſtence. To illuſtrate this, our author aſſumes the function of reſpiration, and ſhews the connections of its variations with thoſe of the other functions.

CLASSIFICATION OF ANIMALS FROM THEIR INTERNAL ORGANIZATION.

- A. With vertebræ.
  - I. Blood warm; heart with two ventricles.
    - a. Viviparous; with mammæ. MAMMALIA.
    - b. Oviparous; without mammæ. AVES.
  - II. Blood cold; heart with one ventricle.
    - a. Lungs; ſometimes accompanied by branchiæ. REPTILES.
    - b. Branchiæ; without lungs. PISCES.
- B. Without vertebræ.
  - I. Having ſanguiferous veſſels.
    - a. Spinal marrow ſimple; no articulated limbs. MOLLUSCA.
    - b. Spinal marrow knotty; no articulated limbs. VERMES.
    - c. Spinal marrow knotty; articulated limbs. CRUSTACEA.
  - II. Without ſanguiferous veſſels.
    - a. Spinal marrow knotty; articulated limbs. INSECTA.
    - b. No ſpinal marrow; no articulated limbs. ZOOPHYTA.

* * *

Mammalia.

A. With nails.

a. Having all three kinds of teeth.

I. Thumbs ſeparate on the ſuperior extremities only.—Genus, Homo; belonging to the *Primates* of Linnæus. *Bimana.*

II. Thumbs ſeparate on all four feet.—Genera, Simia, Lemur; belonging to the *Primates* Lin. *Quadrumana.*

III. No thumbs ſeparate on the fore-feet.

1. Hands elongated; membranes ſtretching from the neck to the anus.—G. Veſpertilio, Galeopithecus; belonging to *Primates* of Lin. *Cheiroptera.*

2. No ſeparate thumbs; the whole of the ſoles of the feet reſting on the ground.—G. Erinaceus, Sorex, Talpa, Urſus; belonging to *Feræ* Lin. *Plantigrada.*

3. No ſeparate thumbs; feet reſting only on the toes.—G. Muſtela,

tela, Viverra, Felis, Cänis; *Feræ* of Lin. *Carnivora.*

4. Thumbs ſeparate on the hind-feet.—Only G. Didelphis; belonging to *Feræ* Lin.
Pedimana.

b. Without ſome kinds of teeth.

IV. Without canine teeth only.—G. Kangarus, Hyſtrix, Lepus, Cavia, Caſtor, Sciurus, Cheiromys, Mus. *Glires* Lin. *Rodentia.*

V. Without inciſive or canine teeth.—G. Myrmecophaga, Oryćteropus, Daſypus; belonging to the *Bruta* Lin.
Edentula.

VI. Without inciſive teeth only.—G. Bradypus; belonging to the *Bruta* Lin. *Tardigrada.*

B. With hoofs.

VII. More than two toes and more than two hoofs.—G. Elephas, belonging to the *Bruta*, and Tapirus, Sus, Hippopotamus, Hyrax and Rhinoceros, to the *Belluæ*, Lin.
Pachodermia.

VIII. Two toes and two hoofs; the *Pecora* of Lin. *Ruminantia.*

IX. One toe, one hoof.—G. Equus; belonging to *Belluæ* of Lin. *Solipeda.*

C. With finny feet.

X. With four feet.—G. Phoca, belong to the *Feræ* Lin. and Trichecus to the *Bruta*. *Amphibia.*

XI. Without hind-feet.—*Cete* Lin. *Cetacea.*

AVES.

I. Feet ſhort, toes armed with ſtrong claws, beak hooked; the *Accipitres* Lin. except Lanius. *Accipitres.*

II. Four toes, three before and one behind; external toes joined entirely, or in part.—G. Lanius, the *Paſſeres*, except Columba, and ſome of the *Picæ*, Lin. *Paſſeres.*

III. Two toes before, and two behind. Part of the *Picæ* Lin. *Scanſores.*

IV. Anterior toes united at their baſe, by a ſhort membrane. *Gallinæ*, and ſome of the *Grallæ*, Lin. *Gallinæ.*

V. Legs long and naked; the two external toes united. Moſt of the *Grallæ* Lin. *Grallæ.*

VI. Toes united by extenſive membranes. *Anſeres* Lin. *Anſeres.*

REPTILES.

A. Heart with two auricles.

I. Body covered on the upper part by a ſhell; jaws covered with horn.—G. Teſtudo, belonging to *Reptiles pedati* Lin. *Chelonii.*

II. Body covered with ſcales; teeth; *Reptiles pedati* Lin. *Saurii.*

B. Heart with a ſingle ventricle.

III. Body covered with ſcales; no feet; no branchiæ at any period.—*Serpentes apodes* Lin. *Ophidii.*

IV. Skin naked; feet; branchiæ in the firſt period of their life.—*Reptiles pedati* Lin. *Batrachii.*

PISCES.

A. Skeleton cartilaginous.

I. Branchiæ fixed.—Part of the *Amphibia nantia* Lin. *Chondropterygii.*

II. Branchiæ looſe.—Part of the *Amphibia nantia* Lin. *Branchioſtegi.*

B. Skeleton bony.

III. No ventral fins.—*Apodes* Linnæi. *Apodes.*

IV. Ventral fins ſituated before the pectoral.—*Jugulares* Lin. *Jugulares.*

V. Ventral fins ſituated below the pectoral.—*Thoracici* Lin. *Thoracici.*

VI. Ventral fins ſituated behind the pectoral.—*Abdominales* Lin. *Abdominales.*

MOLLUSCA.

I. The head, furniſhed with tentacula, which ſupply the place of feet.—Sepia belonging to the *Molluſca*, and Argonauta and Nautilus to the *Cochleæ*, Lin. *Cephalopoda.*

II. The head free, and which crawl on the belly.—*Cochleæ* Lin. *Gaſteropoda.*

III. Without a diſtinct head.—Principally the *Conchæ* Lin. *Acephala.*

VERMES.

I. With external organs of reſpiration, and hairs on the ſides of their bodies.—Some of the *Molluſca* and ſome of the *Teſtacea* Lin.

II. No external organs of reſpiration.

1. Hairs on the ſides of their bodies.—Nais, Lumbricus, Thalaſſerna.
2. No hairs on the ſides of their bodies.—Hirudo, Faſciola, Planaria, Gordius.

Animals, ſimilar to the Vermes, of which the organization is not ſufficiently known, to determine whether they belong to that order, or ſhould form one contiguous to the Zoophytes.

1ſt Family.—Tænia, Hydatigenia, Ligula, Linguatula.

2d Family.—Aſcaris, and other inteſtinal worms.

CRUSTACEA.

I. *Monoculus.*

II. *Cancer.*

INSECTA.

A. With jaws.

I. Without wings. *Gnathaptera.*

II. Four reticulated wings. *Neuroptera.*
III. Four veined wings. *Hymenoptera.*
IV. Four wings; the ſuperior hard, the inferior folded tranſverſely. *Coleoptera.*
V. Four wings; the ſuperior hard, the inferior folded longitudinally. *Orthoptera.*

B. Without jaws.

VI. Four wings, often croſſed; roſtrum articulated. *Hemiptera.*
VII. Four wings covered with ſcales; trunk ſpirally convoluted. *Lepidoptera.*
VIII. Two wings only. *Diptera.*
IX. No wings. *Aptera.*

ZOOPHYTA.

A. Unattached.

I. With a calcareous or coriaceous envelope, and inteſtines floating in the interior cavity. *Echinodermia.*
II. With a fleſhy or gelatinous envelope, and inteſtines hollow, and adhering in the maſs of the body. *Urticaria.*

III. Very ſmall, ſwimming in fluids. *Infuſoria.*

IV. Gelatinous bodies, increaſing by buds. *Polypi.*

B. Attached to a ſolid trunk.

V. In which the medullary ſubſtance traverſes a corneous axis, and terminates in polypi on its branches. *Zoophyta.*

VI. In which each polypus is incloſed in a corneous or calcareous cell, without being connected with a medullary axis. *Eſchara.*

VII. In which a ſolid axis is covered with a ſentient fleſh, from cavities in which the polypi iſſue. *Ceratophyta.*

VIII. In which a ſtony axis or baſis ſerves for the receptacle of the polypi. *Lithophyta.*

IX. In which the baſe is ſpongy, friable or fibrous. *Spongia.*

In the ſecond ſection, our author treats of the organs of motion; and, in the ſubſequent ſections of the firſt volume, he compares minutely, in the different claſſes of animals, the bones and muſcles of the trunk; the anterior extremity, or pectoral limb; the poſterior extremity, or abdominal limb; the organs of motion in animals without vertebræ; and, laſtly, the organs of motion conſidered in action.

The ſecond volume is appropriated to the Organs of Senſation. He firſt examines the head, conſidered as the receptacle of the principal organs of ſenſe. The head conſiſts of two parts; the cranium, containing the brain; and the face, containing the organs of viſion, ſmell, and taſte. The organs of hearing are placed on the ſide of the cranium. A large cranium, and a ſmall face, indicate a large brain, and leſs developed ſenſes of ſmell and taſte.

The relative proportion of the cranium and the face, as indicating that of the two principal external ſenſes, to the brain, alſo indicates a greater or leſs degree of perfection in the internal faculties, compared with the external. Therefore, the form of the head, and the proportion of its two parts, form an important ſtudy to the naturaliſt. In man, the cranium is proportionally the largeſt, and the face the ſmalleſt ; and animals continually become more ſtupid and ferocious as they depart from theſe proportions.

One of the moſt ſimple modes of determining theſe proportions, is by means of the facial line of Camper, and the angle it makes with the baſis of the ſkull. The facial line is ſuppoſed to paſs in contact with the edge of the upper inciſive teeth and the moſt prominent part of the forehead ; and the line of the baſe of the cranium, is that which biſects longitudinally a plane paſſing through the external meatus auditorii, and along the inferior edge of the anterior aperture of the noſtrils. In proportion as the cranium increaſes, the angle made by theſe lines is larger. In the European, it is 90° ; in the negro, 70° ; in the orang-outang, 67° ; dog, 35°, &c.

But ſtill more important relations are diſcovered by means of a vertical and longitudinal ſection of the head. In the European, the area of the ſection of the cranium is about four times as large as that of the face, excluſive of the lower jaw. In the negro, the area of the face increaſes about a fifth. The proportion of the face is ſtill larger in the orang-outang ; in the ſapajous, it is one-half ; and in the mandril, and moſt of the carnivorous animals, they are about equal. In all the other orders of manmalia, the face is largeſt, and ſometimes twice, thrice, or even four times as large, as in the horſe. The compariſon of the different ſections of the cranium and face alſo ſhew ſome remarkable differences. Theſe obſervations are extended to the other claſſes of animals. The reſt of this ſection is occupied with the comparative oſteology of the head.

The ninth ſection treats of the Organization of the Nervous Syſtem. The nerves, and common trunk in which they terminate, that is the ſpinal marrow and brain, conſtitute the interior and common organ of ſenſation and volition. Whatever action be impreſſed on our bodies by external ſubſtances, it produces no ſenſation, unleſs the nerves which terminate in the part which receives the impreſſion paſs freely to the ſpinal marrow and brain. If the nerves be tied or cut, the parts to which they belong become inſenſible ; if the ſpinal marrow be tied or cut, the whole body is rendered paralytic. But there are ſome animals in which this communication of the branches of the nerves, with their common trunk, is not neceſſary either for ſenſation or volition, as the turtle and frog; and there are inſects and worms, which, when cut into ſeveral pieces, form as many individuals, having each ſenſation and volition. The neceſſity of communication is greater in proportion as the central part of the nervous ſyſtem is greater than its ramifications. The polypi, in which it is equally diſtributed throughout the whole body, may be divided almoſt to infinity, and each part acquires particular individuality.

In animals of a ſuperior order, the ſpinal marrow is incomparably larger than the nerves which ariſe from it, and the brain is ſtill much larger than the ſpinal marrow. Theſe circumſtances are more remarkable in man, than in any other animal. In the cold-blooded animals, and eſpecially in fiſhes, the brain is ſcarcely larger than the ſpinal marrow. In the molluſca, there is only a brain, from which the nerves proceed in rays, and form ganglions, almoſt as large as the brain itſelf. In inſects, the brain is not larger than any of the numerous knots of the ſpinal marrow, and both produce nerves in the ſame way. As we deſcend along the ſcale of animals, we find the medullary ſubſtance leſs concentrated in a particular part of the ſyſtem, but more equally diſtributed throughout the whole.

The brain of cold-blooded animals is ſofter than that of the warm-blooded, and in ſome fiſhes it is almoſt fluid: There is, beſides, no difference of colour between the cortical and medullary parts, and ſcarcely any difference of conſiſtence.

The nervous ſyſtem is ſuſceptible of one action relative to our ſentient faculty, and of another connected with our vital or vegetative functions. The firſt includes our ſenſations and volitions; the ſecond the influence of the nerves on digeſtion, circulation, and ſecretion. Sympathy, and the phyſical changes which ſucceed to certain ideas, ſeem to partake of both kinds of action. The ſenſations may be divided into external, internal, and ſpontaneous. The firſt proceed from the impreſſion of external cauſes on our organs of ſenſe; the ſecond from changes in the internal parts of our body or nerves, and the laſt from a change taking place in the nerves or brain itſelf, without being excited by an external cauſe. The ſentient faculty may be exhauſted not only in the body in general by too violent or long-continued ſenſations, but alſo in each particular organ. Whether any ſubſtance contained in the nerves be expended in ſenſation, or whether it only undergo ſome change in its chemical nature, it muſt be confined in the nerves in their courſe, and only have the power of eſcaping at the extremities; and as the nerves are not tubulous, it ſeems to be retained in them, as the electric matter is retained in an inſulated body rendered electrical by communication, and to be conducted only by the nervous ſyſtem, while all other parts of the animal body are non-conductors.

In whatever manner impreſſions be tranſmitted, they muſt be propagated to the brain. What paſſes within the brain is totally unknown. Phyſiology only teaches us, that exceſſive meditation produces a ſenſation of fatigue; that certain morbid affections change the natural arragement of ideas; that age weakens them; that wine and opium produce very conſiderable changes in them; that other alimentary and medicinal ſubſtances produce leſs conſiderable changes, each according to its own nature, and the nature of the ſubject; and that the imagination and the will have phyſical effects upon the body, which ſeem to be, as it were, a repercuſſion of the effects which the phyſical changes of the body have upon them.

The nerves are the inſtruments by which volition produces muſcular action. The effects of imagination conſiſt in a ſudden increaſe of certain ſecretions, or the accumulation of blood in particular parts. There is alſo a reciprocal action between the nerves and the vital organs. In theſe, the nerves act by influencing the irritability of the arteries. The actions which take place in conſequence of the connection of one nerve with another, are termed Sympathies; and, laſtly, a real effect is produced, through the intervention of the nervous ſyſtem, by the proximity of two animated bodies, independently of any participation of imagination.

In comparing the action of the nervous ſyſtem in different orders of animals, we meet with almoſt inſurmountable difficulties, as we only know the affections of animals by equivocal ſigns. In all animals which have nerves, voluntary motions and ſenſations take place by the ſame means as in man. The differences in the former ariſe from the organization of the organs; the differences in the latter depend on the number of their ſenſes, and the perfection of the ſeveral organs of ſenſe. The animals reſembling man poſſeſs the ſame number of ſenſes, and ſometimes ſome of them in a greater degree of perfection. In proportion as they differ from us, their ſenſes become leſs numerous, and ſome of them leſs perfect; but perhaps ſome of them poſſeſs ſenſes of which we have no idea. We do not know if the intrinſic ſenſibility varies in different animals. The more perfect animals have ſpontaneous ideas. The paſſions produce the ſame effects in them as in us; they poſſeſs memory; and ſome of them exhibit a certain degree of judgment. The ſympathies and the influence of the nerves on the vital actions, are ſubjected to the ſame laws in animals as in man.

In comparing all the nervous ſyſtems, we find only one part common to all: It is a ſingle tubercle, ſituated at the anterior extremity of the ſyſtem, and conſtantly producing two lateral and tranſverſe chords or two legs, which unite it to the reſt of the ſyſtem. This part ſeems always to correſpond to the cerebellum in man.

The cerebellum of vertebrated animals with red blood, is always preceded by ſeveral pairs of tubercles, forming in general a maſs larger than itſelf, and united to the reſt of the ſyſtem by two longitudinal chords or legs, which croſs and mingle with thoſe of the cerebellum,. ſo that they are blended in the maſs which forms the root of the medulla oblongata and ſpinalis, and do not leave any ſpace between them. Theſe tubercles conſtitute the brain, and preſent, in the different orders of animals, many varieties.

In animals with white blood, there are alſo pairs of tubercles before the part correſponding to the cerebellum, but they are often ſmaller, at a diſtance from each other, and united to the cerebellum only by nervous and ſeparate filaments. The legs of the cerebellum leave a conſiderable interval between them, through which the œſophagus paſſes.

The long production of the encephalon, called the Spinal Marrow, in vertebrated animals,

mals, remains in the back above the inteſtinal tube, and is incloſed in the canal of the vertebræ. The two chords of which it is compoſed are intimately united, and only diſtinguiſhed by a groove before and behind. In animals without vertebræ, when they have this production, it is formed below the œſophagus, by the union of the legs of the cerebellum, and its two parts commonly remain diſtinct in the greater part of their extent, and are only united from ſpace to ſpace by the ganglions from which the nerves ariſe. But very often this production does not exiſt.

In thoſe white-blooded animals which have no medullary production, that is in the molluſca, the nervous trunks ariſing from the legs of the cerebellum, ſwell into ganglions, or two or three of them unite to form a common ganglion ; and from theſe ganglions, the filaments going to the different parts of the body commonly ariſe.

In the inſects, cruſtacea, and certain worms, or the white-blooded animals, which have a double and knotty medullary production, all the nerves ariſe from the ganglions of the medulla, or from ſome of the ganglions anterior to the cerebellum.

In the red-blooded animals, the ſpinal nerves ariſe from the ſpinal marrow, in two bundles of medullary fibres, which unite after the poſterior bundle has formed a ganglion. They then ſeparate into two trunks, of which the anterior communicates with the great ſympathetic nerve, by one or two filaments; and at the place of this union there is alſo a ganglion.

The nerves of the encephalon do not preſent a ſimilar arrangement; but the different tumors which form the brain, ſeem to ſerve as ganglions, at leaſt to ſeveral of the nerves.

The great ſympathetic nerve, which is conſtantly found in red-blooded animals, does not exiſt in any animal with white blood; at leaſt if we do not conſider as ſuch the two nervous filaments which unite all the ganglions, and to which we have given the name of Spinal Marrow in the cruſtacea, inſects and worms. In that caſe, theſe animals will not have any ſpinal marrow, and the abſence of that production will conſtitute a common character of all animals with white blood.

The obſervations on the organs of ſenſe are alſo of great importance, from the novelty of the deſcriptions, the philoſophical reflections to which they give riſe, and the information they afford with regard to the functions of man.

In treating of each ſenſe, the author firſt gives a general idea of the function, then deſcribes the entire organ in the different claſſes of animals, and concludes with a minute compariſon of its parts, wherever nature has indulged herſelf in variety.